

## MEMORANDUM

Date: October 16, 2012  
To: Yvetteh Ortiz, City of El Cerrito  
From: Ian Moore, Ryan McClain, and Carrie Nielson, Fehr & Peers  
Subject: **Brewster Drive/Arlington Boulevard Intersection Concept Designs**

WC12-2889.01

---

Fehr & Peers conducted a safety assessment at the Arlington Boulevard/Brewster Drive (south) intersection in the City of El Cerrito and prepared conceptual design drawings for phased safety improvements. This memorandum presents the existing conditions at the Arlington Boulevard/Brewster Drive (south) intersection in addition to the proposed Phase 1 (short-term, low-cost) and Phase 2 (grant funded) conceptual designs.

### BACKGROUND

Arlington Boulevard is a minor arterial that carries regional traffic through the El Cerrito, Kensington, and Berkeley hills. It is also an important north-south connection for bicyclists and pedestrians and is designated as a pedestrian and bicycle route in the City of El Cerrito's *Circulation Plan for Bicyclists and Pedestrian* (2007). **Figure 1** shows the study area. In the last ten years, seven reported collisions occurred at the intersection. The collision rate for the section of Arlington Boulevard between Thors Bay Road and Moeser Lane (which includes the Brewster Drive south intersection) is 1.79 collisions per million vehicle miles. This is slightly lower than the rate on Arlington Boulevard between Cutting Boulevard and Thors Bay Road (1.96) and lower than the statewide average collision rate of 3.05 for similar types of facilities. A fatal pedestrian-bicyclist collision in 2012 renewed neighborhood and City commitment to further improve safety at the intersection. In response to neighborhood concerns, prevailing speeds, and known roadway design concerns at several intersections and curves, the City has studied the Arlington Boulevard/Brewster Drive intersection and the Arlington Boulevard corridor, implementing multiple striping and signage treatments to reduce speeds and increase pedestrian safety.



## EXISTING CONDITIONS

The Arlington Boulevard/Brewster Drive (south) intersection is a three-way, side-street stop-controlled intersection. The intersection is located on a compound curve that has an advisory speed limit of 15 miles per hour (mph). The intersection is also at a low point, with all three approaches sloping down towards the intersection. **Figure 2** presents existing site photos.

### *Pedestrian and Bicyclist Issues*

Fifty feet to the south of the intersection, a 14.5-foot wide high-visibility striped crosswalk connects the community path/staircase with the sidewalk on the east side of Arlington Boulevard. No curb ramps are provided. Sightlines are obstructed for southbound traffic as it approaches the existing crosswalk as a result of the curvature of the roadway and vegetation. For northbound traffic, vegetation on adjacent private properties creates gaps in sight lines. The crosswalk does not meet all pedestrian desire lines and primarily serves those using the staircase/path. The shoulder on the west side of Arlington Boulevard is cross-hatched between the crosswalk and the Brewster Drive intersection.

Because sidewalk is located on the east side of Arlington Boulevard, with no sidewalk on either side of Brewster Drive, the intersection has no marked or unmarked crosswalks, based on the California Vehicle Code definition of a crosswalk<sup>1</sup>. To reach the crosswalk from Brewster Drive, pedestrians must walk on the shoulder of Arlington Boulevard. However, some pedestrians prefer to cross at the intersection, which may be due to improved sight distance of southbound traffic and the pedestrian desire line to take the most direct route across Arlington Boulevard..

Arlington Boulevard is a popular bicycle route and is a designated Class III bicycle route. With the wide shoulder on both sides of Arlington Boulevard through the intersection, some cyclists ride on the outside of the travelway rather than "taking the lane" and riding in the center of the travel lane.

### *Roadway Design Issues*

The horizontal and vertical curvature of the roadway geometry through the intersection limits sight lines. Northbound vehicles turning left onto Brewster Drive must stop at the low point of

---

<sup>1</sup> Based on California Vehicle Code Section 275 "Crosswalk".



the roadway and in the horizontal curve as they wait for a gap in oncoming southbound traffic, limiting their visibility to approaching northbound traffic.

Many drivers were observed crossing over the centerline to avoid reducing their speed around the curve. Because the curvature of the roadway naturally slows vehicles as they navigate the curve, drivers attempt to "smooth out the curve", crossing over the centerline to take the curve at higher speeds. Additionally, the large turning radius of the southwest corner of the intersection creates conditions that allow eastbound right-turning vehicles to take the turn quickly and not fully comply with the STOP sign.

The super elevation of Arlington Boulevard through the curve was also studied. The curve at the intersection has a radius of approximately 65 feet. The southbound travel lane has a super elevation close to zero approaching the intersection, and through the curve, the cross slope ranges from -1 to 1%. Based on Table 3-13b of the *Highway Design Manual*, the minimum radius of curvature for a 15MPH design speed would be approximately 47 feet for 15 MPH and 99 feet for 20 MPH, with a zero percent super elevation. The northbound travel lane has a super elevation of 3.5 to 6% through the curve. With a 15MPH design speed, the radius would range from 39 to 42 feet and for a 20 MPH design speed the radius ranges from 80 to 87 feet. Therefore, the design speed is between 15 and 20 MPH and continuing to sign the advisory speed limit at 15MPH through the curve is appropriate.

## CONCEPTUAL DESIGNS

The horizontal and vertical curvatures of Arlington Boulevard cannot be altered readily due to surrounding private residential development, drainage, and construction impact concerns. However, several traffic safety elements could be installed to effectively change the geometry of the intersection and approaching roadway segments and, in doing so, slow vehicles, clearly communicate the presence of the pedestrian crossing, keep vehicles in their lane, and create an overall safer environment. Two conceptual designs were developed. First, a design that would be easier to implement and lower cost to address the immediate needs at the intersection and a design that would require significant funding and would provide a permanent design solution. Both concepts were presented to the community at a public meeting held on July 10<sup>th</sup>, 2012.



### Phase 1 Design

The Phase 1 design proposes to improve the Arlington Boulevard/Brewster Drive intersection for pedestrians with curb extensions, new crosswalks, and enhanced lane markings. **Figure 3** presents the Phase 1 design. Using striping and raised curb, the intersection would be realigned so that Brewster Drive and Arlington Boulevard meet at 90-degrees, with crosswalks marked on the west and south legs of the intersection to clearly establish pedestrian right-of-way and improve sightlines for all roadway users. The crosswalk across Arlington Boulevard would be a ladder-style high-visibility crosswalk and would replace the existing crosswalk south of the intersection. Raised curb with a handrail along the edge of the southbound travel lane, preventing crossings at the current crosswalk location, would formalize the pedestrian space between the community staircase/path and the intersection and consolidate pedestrian crossing activity to a single location with the best visibility.

On the southwest corner of the intersection, raised curb islands would provide a curb extension with openings for pedestrians, reducing pedestrian exposure at the intersection while providing an Americans with Disabilities Act (ADA) clear path. On the northwest corner of the intersection, a curb extension would be striped with an edgeline and cross-hatching to identify pedestrian space near the bus stop and to provide a landing for the proposed marked crosswalk across Brewster Drive. The same striping pattern would be applied to the northbound shoulder adjacent to the existing bus stop and to the south of the intersection. The new striping and curb extensions will reduce speeds at the potential pedestrian/vehicle and pedestrian/bicycle conflict points, visually narrowing the roadway and discouraging drivers and cyclists from crossing into the shoulder to take the curve faster.

Sharrows would be applied through the curve and to the north and south in order to encourage bicyclists to “take the lane” and position themselves in the center of the travel lane through the curve. The botts dots on the northbound edgeline would further channelize cyclists and encourage them to stay in the travel lane rather than entering the wide shoulder area.

The centerline and edgelines on Arlington Boulevard would be restriped 350 feet to the north and south of the intersection. Through the curve at the intersection, the southbound travel lane will be wide enough to accommodate buses and trucks operating adjacent to the proposed handrail and asphalt curb. “Botts dots” would be applied to the centerline through the curve and approaches. The Botts dots would serve as a tactile and audible warning to encourage drivers to stay in their lane rather than crossing over the centerline to take the curve at a higher speed. A



break in the Botts dots, along with a dashed centerline through the intersection would be used to indicate clearly that northbound left-turns from Arlington Boulevard to Brewster Drive are legal at the intersection.

### **Phase 2 Design**

The Phase 2 concept is the long-term design solution and consists of additional measures that the City can implement as funding becomes available for the project. **Figure 4** shows the Phase 2 design.

The Phase 2 design would assume removal of the Phase 1 asphalt curb and handrail. Those temporary measures would be replaced with a concrete sidewalk and curb extensions with curb and gutter, formalizing the "T" intersection configuration achieved with striping under Phase 1. The southwest curb extension would allow access to the existing private driveway on the south side of Brewster Drive. The concrete curb extensions would include ADA curb ramps. Concrete sidewalk would replace the temporary path between the intersection and the community staircase/path. It would also be constructed north of the intersection, serving the bus stop and continuing north, as funding allows, to serve the parallel parking on the west side of Arlington Boulevard. This would replace the Phase 1 striped shoulder and curb extension on the west side of Arlington Boulevard.

Additionally, to address downhill speeds as autos and bicyclists enter the curve, electronic speed feedback signs are proposed in directions in advance of the intersection in both directions. Bus stop improvements are also proposed.

Curb extensions will be constructed on the northwest and southwest corners of the intersection, which reconfigure the intersection as a 90-degree "T" intersection. This will improve sight-lines of pedestrians in the new marked crosswalk and increase compliance with the STOP sign, thereby reducing eastbound right-turn vehicle speeds.

### **Other Measures Considered and Not Proposed**

Both in-pavement flashers and rectangular rapid flashing beacons (RRFBs) were considered but ultimately not recommended. Though RRFBs are approved for use on two-way roadways, the major benefit documented is a reduction in multiple threat collisions, whereby a vehicle in one lane yields to a pedestrian while a vehicle in the next lane traveling in the same direction proceeds and cannot see the oncoming pedestrian. In-pavement flashers were not



recommended due to visibility issues at this location. Due the horizontal and vertical curvature of the roadway, in-pavement flashers may not be visible to oncoming traffic, and actuating the device would give pedestrians a sense of security that may be false if oncoming traffic cannot see the flashers.

Speed tables and raised crosswalks were also considered. These devices are not recommended due to the horizontal and vertical geometry which limit visibility within and near to the curve. Additionally, Arlington Boulevard is a transit route and an emergency access route and vertical elements such as these impact both buses and fire trucks. Speed tables and raised crosswalks could be implemented elsewhere on Arlington as roadway geometry permits; however, buses and fire trucks should still be considered.

Adjusting the advisory speed limit was also discussed. However, the 15MPH design speed was verified using the super elevation and curvature of the roadway measured in the field and the *Highway Design Manual*.

## EDUCATION & ENFORCEMENT

Recent speed surveys conducted by City Staff and the Police Department have shown a slight decrease in 85<sup>th</sup> Percentile speeds from 33MPH to 31MPH over the last 10 years on the Arlington Boulevard corridor. Based on the speed survey data, speed limits on Arlington Boulevard remain enforceable by the Police Department. As such, continued enforcement of speeds on Arlington Boulevard remains important for the safety of all roadway users. While the various measures of the Phase 1 and 2 designs will help lower both auto and bicycle speeds through the area, the City may consider looking for opportunities to address bicyclist behavior, including reaching out to local cycling clubs or the East Bay Bicycle Coalition (EBBC). For example, City staff might coordinate with the EBBC to feature the implemented project on the organization's website to make local cyclists aware of the changes and to address ongoing education and enforcement issues.